Claims

- 1. A system for classifying aerosol particles comprising:
- a detector capable of generating a signal corresponding to a composite emission decay profile of an emission from an aerosol particle; and

means for deconvolving the signal into a discriminant vector that provides an indication of the nature of the aerosol particle.

- 10 2. A system for classifying aerosol particles comprising:
 - a detector capable of generating a signal corresponding to a composite emission decay profile of an emission from a sample of aerosol particles; and
 - a processor coupled to the detector to receive the signal,

wherein the processor can determine a scatter component and a fluorescence component of the composite emission decay profile.

- 3. The system of claim 2, wherein the fluorescence component comprises a biological component and a non-biological component.
- 4. The system of claim 3, wherein the processor can determine a scatter intensity value corresponding to the scatter component.
 - 5. The system of claim 4, wherein the processor can determine a non-biological fluorescence value corresponding to the non-biological component.

- 6. The system of claim 5, wherein the processor can determine a biological fluorescence value corresponding to the biological component.
- 7. The system of claim 2, further comprising a radiation source disposed to discharge electromagnetic energy to stimulate the emission from the sample.

8. A method of classifying an aerosol particle comprising:

measuring a composite emission decay profile of an emission from the aerosol particle;

determining a biological fluorescence time constant of the composite emission decay profile; and

determining a biological emission constant of the composite emission decay profile.

- 9. The method of claim 8, further comprising stimulating the aerosol particle.
- 10. The method of claim 8, further comprising determining a scatter emission constant of the composite emission decay profile.
- 11. The method of claim 10, further comprising determining a non-biological fluorescence time constant of the composite emission decay profile.
 - 12. The method of claim 11, further comprising determining a non-biological emission constant of the composite emission decay profile.
- 13. The method of claim 12, further comprising normalizing the scatter emission constant, the biological emission constant, and the non-biological emission constant relative to the scatter emission constant to produce a scatter component, a biological component, and a non-biological component.
- 25 14. The method of claim 13, further comprising mapping the scatter component relative to the biological component and the non-biological component to provide an indication of the nature of the aerosol particle.
- 15. The method of claim 12, further comprising determining a second biological fluorescence time constant of the composite emission decay profile.

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- 16. The method of claim 15, further comprising determining a second biological emission constant of the composite emission decay profile.
- 17. The method of claim 12, further comprising determining a second non-biological time constant of the composite emission decay profile.
 - 18. The method of claim 17, further comprising determining a second biological emission constant of the composite emission decay profile.
- 19. A method of classifying aerosol particles comprising:
 stimulating the aerosol particles to promote radiation emission;
 measuring a composite emission decay profile of the radiation emission, the
 composite emission decay profile comprising a scatter component, a first fluorescence
 component, and a second fluorescence component;
 - determining a scatter emission constant corresponding to the scatter component;

determining a first fluorescence emission constant of the composite emission decay profile; and

determining a second fluorescence emission constant of the composite emission decay profile.

- 20. The method of claim 19, further comprising deriving a first fluorescence time constant corresponding to the first fluorescence component.
- 25 21. The method of claim 20, further comprising deriving a second fluorescence time constant corresponding to the second fluorescence component.
 - 22. The method of claim 19, further comprising determining a discriminant vector of the radiation emission as a function of the scatter emission constant, the first fluorescence emission constant, and the second fluorescence emission constant.

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- 23. The method of claim 22, further comprising mapping the discriminant vector to provide an indication of the nature of the aerosol particle.
- 24. A method of classifying aerosol particles comprising:

measuring a composite emission from an aerosol particle;

deconvolving the composite emission to determine a discriminant vector of the aerosol particle; and

mapping the discriminant vector to provide an indication of the nature of the aerosol particle.

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- 25. The method of claim 24, further comprising stimulating the aerosol particle to promote the composite emission.
- The method of claim 24, wherein deconvolving the composite emission
 comprises determining a scatter emission constant and at least one of a biological
 emission constant and a non-biological emission constant.